REMARKS

Claims 1-16 and 33 are all the claims pending in the application.

In view of the filing of a Request for Continued Examination, applicants request the Examiner for an interview to discuss the present application and the below response prior to the issuance of the first Office Action.

Claims 1- 16 and 33 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Ohmori et al (US 2002/0150532) in view of Tanaka et al (US 6544493) with further in view of Miyoshi (US 6485701).

Applicants submit that Ohmori et al, Tanaka et al and Miyoshi do not disclose or render obvious the presently claimed invention and, accordingly, request withdrawal of this rejection.

The present invention as set forth in claim 1 is directed to a method for producing a titanium-containing perovskite compound that has ferroelectricity, wherein the method comprises a step of reacting titanium oxide produced through a vapor-phase method with at least one element selected from a group of alkaline earth metal compound and Pb compound in an alkaline solution, wherein when the titanium oxide contains rutile titanium oxide, the content of anatase titanium oxide is 20 to 100 mass%.

As disclosed in the present specification, when a titanium-containing perovskite compound is synthesized by a method employing a titanium oxide sol, the perovskite exhibits paraelectricity. See page 23, lines 1-6 of the present specification. The heat resistance and dispersibility of such a perovskite is inferior to one obtained by the present invention.

Ohmori et al disclose a process for producing a perovskite titanium-containing composite oxide from a starting titanium oxide. Ohmori et al disclose that the preferred method for

producing the starting titanium oxide is to produce a titanium oxide sol by subjecting a titanium salt to hydrolysis in an acid solution.

The obtaining of ferroelectricity as set forth in the present claims is an unexpected result.

The titanium-containing perovskite compound obtained in Ohmori et al is cubic. See the Examples and the like, and is paraelectric. Thermal treatment at about 900°C or higher is required to convert cubic crystals to tetragonal crystals having ferroelectricity. See JPA-2003-252623 cited in the BACKGROUND ART section of the present specification, which corresponds to US 7,556,792, for a disclosure of the temperature for converting cubic crystals to tetragonal crystals.

Applicants submit that one of ordinary skill in the art would not expect to obtain a ferroelectric titanium-containing perovskite compound without thermal treatment as an essential requirement by employing the titanium oxide of Tanaka et al in the method of obtaining a paraelectric titanium-containing perovskite compound as in Ohmori et al.

The Examiner states that Ohmori et al disclose in paragraph [0022] that brookite crystalline are formed by subjecting the anatase titanium oxide particles to thermal treatment in a vapor phase.

In response, as applicants have previously argued, the vapor phase that is referred to in Ohmori et al relates to treating an already formed titanium dioxide, and does not relate to the initial forming of titanium dioxide.

Ohmori et al do not teach that the titanium oxide itself is produced through a vapor-phase method. Generally, as in the present claims, the term "titanium oxide produced through a vapor-phase method" means titanium oxide produced from a material other than titanium oxide through a vapor-phase method.

In paragraph 19 of the Office Action, the Examiner argues that Ohmori et al point out two methods of producing, vapor process and hydrolysis in liquid phase and anyone in the art at the time of the invention would be motivated to experiment with the vapor phase if the hydrolysis in liquid phase has deficiencies as stated.

However, the Examiner has not set forth any comments on applicants' argument that the vapor phase that is referred to in Ohmori et al relates to treating an already formed titanium dioxide, and does not relate to the initial forming of titanium dioxide and that Ohmori et al do not teach that the titanium oxide itself is produced through a vapor-phase method.

Applicants request the Examiner to respond to applicants' above arguments relating to Ohmori et al.

In support of applicants' arguments, applicants again note that US 6,544,493 to Tanaka et al that the Examiner cites has a description of "a vapor phase process where a volatile starting material such as titanium tetrachloride is vaporized and then reacted in the gas state with an oxidizing gas such as oxygen or steam at a high temperature." See column 1, third line from the bottom to column 2, line 1. Further, claims 4 to 11 of the present specification are claims which set forth a material other than titanium oxide for producing the titanium oxide produced through a vapor-phase method.

The Examiner states that Tanaka et al disclose that the liquid phase process for producing titanium dioxide is disadvantageous because the produced titanium dioxide powder undergoes heavy aggregation. The Examiner states that Tanaka et al teach that their vapor phase process overcomes this problem of aggregation. The Examiner argues that one of ordinary skill in the art would therefore employ the vapor phase method of Tanaka et al in the method of Ohmori et al in order to avoid the problem of aggregation and to improve the quality of the particles.

In response, as applicants have previously argued, the problem of "heavy aggregation" described in Tanaka et al at column 2, lines 5 to 7 relates to titanium oxide "powder" produced through a liquid-phase method, and does not relate to other forms of titanium oxide produced through a liquid-phase method. The reason why Tanaka et al specifically point to "powder" is because, in general, titanium oxide powder is likely to undergo aggregation during a step of drying the titanium oxide produced by the liquid phase method.

On the other hand, the method of Ohmori et al does not comprise a step of powdering (drying) the titanium oxide. Therefore, the problem of aggregation of the titanium oxide powder will not arise in Ohmori et al. Accordingly, there is no motivation for one of ordinary skill in the art to employ the invention of Tanaka et al in Ohmori et al to solve the problem of aggregation disclosed in Tanaka et al, which problem does not arise in Ohmori et al.

The Examiner has not commented on and has ignored applicants' argument that the disadvantages that are described by Tanaka et al are the problem of "heavy aggregation" described in Tanaka et al at column 2, lines 5 to 7 and relate to titanium oxide "powder" produced through a liquid-phase method, and does not relate to other forms of titanium oxide produced through a liquid-phase method, that the reason why Tanaka et al specifically point to "powder" is because, in general, titanium oxide powder is likely to undergo aggregation during a step of drying the titanium oxide produced by the liquid-phase method, that, on the other hand, the method of Ohmori et al does not comprise a step of powdering (drying) the titanium oxide, that, therefore, the problem of aggregation of the titanium oxide powder will not arise in Ohmori et al, and, accordingly, there is no motivation for one of ordinary skill in the art to employ the invention of Tanaka et al in Ohmori et al to solve the problem of aggregation disclosed in Tanaka et al, which problem does not arise in Ohmori et al.

Applicants request the Examiner to respond to the above arguments.

Further, as applicants have previously argued, a titanium oxide slurry can be produced in the process for producing the titanium oxide as taught by Ohmori et al. By the vapor phase method of Tanaka et al, a titanium oxide slurry is not produced, but instead a titanium oxide powder can be produced. Therefore, the above-mentioned process of Ohmori et al cannot be substituted with the vapor phase method of Tanaka et al. To substitute the method of Ohmori et al with that of Tanaka et al, a process of making the powder into slurry is further required in addition to the vapor phase method of Tanaka et al.

From an industrial viewpoint, one of ordinary skill in the art would not have been motivated to employ a method wherein an extra process (process of making the powder into slurry) is required, even if the particle diameter and a starting material (tetrachloride) are the same in the two methods.

Applicants request the Examiner to respond to these arguments.

With respect to the Examiner's argument in paragraph 17 at page 8 of the Office Action that Ohmori et al clearly disclose that the reaction conditions are not limited, and vapor phase was mentioned, and it is preferable to carry out the reaction in an alkaline solution as disclosed in paragraph [0030] of Ohmori et al, applicants again point out that the alkaline solution in paragraph [0030] of Ohmori et al relates to the forming of the perovskite and not to the forming of the titanium oxide. Further, as discussed above, the vapor phase that is referred to in Ohmori et al relates to treating an already formed titanium dioxide, and does not relate to the initial forming of titanium dioxide. Ohmori et al do not teach that the titanium oxide itself is produced through a vapor-phase method.

Applicants request the Examiner to respond to these arguments.

With respect to Miyoshi, applicants maintain their previous arguments that Miyoshi supports applicants' position.

The Examiner cites Miyoshi as showing that an oxide having a perovskite structure, such as barium titanate, and made from the anatase form of titanium oxide, have ferroelectricity. The Examiner argues it is therefore expected that titanium oxide having a high amount of anatase form would exhibit ferroelectricity.

As applicants have previously argued, Miyoshi supports applicants' position. In particular, Miyoshi disclose that barium titanate prepared by a conventional wet method does not have sufficient ferroelectricity. Miyoshi disclose that in order to prepare a barium titanate having sufficient ferroelectricity, a method is employed in which a metallic oxide powder having a particular specific surface area and a metallic carbonate powder are mixed, and then heat treated at a specific partial pressure of oxygen. In other words, Miyoshi disclose that special manufacturing conditions are necessary, but Miyoshi do not disclose or suggest that the method of the present invention can be used to obtain ferroelectricity.

In addition, the Examples of Miyoshi teach that a TiO_2 powder made of anatase TiO_2 was used, although a TiO_2 powder made of rutile TiO_2 or TiO_2 of a mixture of anatase and rutile may be used so as to produce a similar effect. See column 9, lines 47 to 31. That is, Miyoshi show that using anatase TiO_2 as a material does not relate to ferroelectricity of the product thereof.

Miyoshi does not indicate how the titanium oxide employed in the Miyoshi invention was prepared, and does not indicate that the method of preparing the titanium oxide has any effect on their method.

Applicants point out further that claims 1 and 33 recite a step of reacting titanium oxide in an alkaline solution. Therefore, applicants submit that the present invention is distinguished over the solid-phase method of Miyoshi.

The Examiner has not commented on the above arguments relating to Miyoshi. Applicants request the Examiner to respond to the above arguments relating to Miyoshi.

Miyoshi points out problems involved in a conventional wet method, and teaches that the problems can be solved by a specifica solid-phase method, which teaches away from employing a liquid-phase method as taught by the present invention. Therefore, it would not be possible to employ the solid-phase technique of Miyoshi, which teaches away from using a liquid-phase method, in the invention of Ohmori et al that employs a liquid-phase method. Also, the objectives of the present invention cannot be achieved by the method of Miyoshi based on a solid-phase method.

In view of the above, applicants submit that Ohmori et al, Tanaka et al and Miyoshi do not disclose or render obvious the presently claimed invention and, accordingly, request withdrawal of this rejection.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

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